**Lines of Defense**

1. **Phagocytosis**
2. **Humoral**
3. **Cellular**

**Table 50-1 IMMUNE SYSTEM DISORDERS (Smeltzer pg. 1545)**

**Disorder Description**

Autoimmunity- Normal protective immune response paradoxically turns against or attacks the body, leading to tissue damage

Hypersensitivity- Body produces inappropriate or exaggerated responses to specific antigens

Gammopathies Immune deficiencies- Immunoglobulins are overproduced

Primary Deficiency- results from improper development of immune cells or tissues; usually congenital or inherited

Secondary Deficiency- results from some interference with an already developed immune system; usually acquired later in life

There are four well-defined stages in an immune response: recognition, proliferation, response, and effector

The body can produce five different types of immunoglobulins (Ig). Each of the five types, or classes, is identified by a specific letter of the alphabet, IgA, IgD, IgE, IgG, and IgM. Classification is based on the chemical structure and biologic role of the individual immunoglobulin. Major characteristics of the immunoglobulins are summarized

in Chart 50-2. The normal laboratory values for the

three major immunoglobulins (IgA, IgG and IgM) can be

found in Table 54-1 and Appendix A.

**Chart 50-2 *• Major Characteristics of the***

***Immunoglobulins***

**IgG (75% of Total Immunoglobulin)**

• Appears in serum and tissues (interstitial fluid)

• Assumes a major role in bloodborne and tissue infections

• Activates the complement system

• Enhances phagocytosis

• Crosses the placenta

**IgA (15% of Total Immunoglobulin)**

• Appears in body fluids (blood, saliva, tears, breast milk, and pulmonary, gastrointestinal, prostatic, and vaginal secretions)

• Protects against respiratory, gastrointestinal, and

genitourinary infections

• Prevents absorption of antigens from food

• Passes to neonate in breast milk for protection

**IgM (10% of Total Immunoglobulin)**

• Appears mostly in intravascular serum

• Appears as the first immunoglobulin produced in

response to bacterial and viral infections

• Activates the complement system

**IgD (0.2% of Total Immunoglobulin)**

• Appears in small amounts in serum

• Possibly influences B-lymphocyte differentiation, but role

is unclear

**IgE (0.004% of Total Immunoglobulin)**

• Appears in serum

• Takes part in allergic and some hypersensitivity reactions

• Combats parasitic infections

***Immunomodulators***

While antimicrobial agents and vaccines have yielded considerable therapeutic success and the immune system usually works effectively, many infectious diseases remain difficult clinical challenges. Treatment success may be compromised by defects of the immune system; in this case, enhancement of the host immune response may be therapeutically beneficial. An immunomodulator (also known as a biologic response modifier) affects the host via direct or indirect effects on one or more components of the immunoregulatory network. Interferons and colony-stimulating factors are two of the more commonly used immunomodulators.

**interferons:** proteins formed when cells are exposed to viral

or foreign agents; capable of activating other components

of the immune system

Colony-stimulating factors are a group of naturally occurring glycoprotein cytokines that regulate production, differentiation, survival, and activation of hematopoietic cells.

**Age Related Issues (Table 50-4 pg. 1554, Smeltzer)**

Immunosenescence is a complex route in which the aging process stimulates changes in the immune system. The immune system undergoes age-associated alterations that lead to a progressive deterioration in the ability to respond to infections.

**Nurse Management**

The nurse needs to be aware that patients undergoing evaluation

for possible immune system disorders experience not

only physical pain and discomfort with certain types of diagnostic

procedures, but also many psychological reactions.

It is the nurse’s role to counsel, educate, and support

patients throughout the diagnostic process. Many patients

may be extremely anxious about the results of diagnostic

tests and the possible implications of those results for their

employment, insurance, and personal relationships. This is

an ideal time for the nurse to provide counseling and education,

should these interventions be warranted.

**ALTERED IMMUNE RESPONSES**

* **Immunity**is a state of responsiveness to foreign substances such as microorganisms and tumor proteins. Immune responses serve three functions: defense, homeostasis, and surveillance.
* Immunity is classified as innate (natural) or acquired. Acquired immunityis the development of immunity, either active or passive.
* The immune response involves complex interactions of T cells, B cells, monocytes, and neutrophils. These interactions depend on **cytokines** (soluble factors secreted by WBCs and a variety of other cells in the body) that act as messengers between the cell types.
* **Humoral immunity** consists of antibody-mediated immunity. In contrast, immune responses initiated through specific antigen recognition by T cells are termed **cell-mediated immunity.** Both humoral and cell-mediated immunity are needed to remain healthy.
* **Immunocompetence** exists when the body’s immune system can identify and inactivate or destroy foreign substances.
* A **hypersensitivity reaction** occurs when the immune response is overreactive against foreign antigens or fails to maintain self-tolerance. This results in tissue damage.
* Although an alteration of the immune system may be manifested in many ways, allergies or type I hypersensitivity reactions are seen most frequently.
  + Common allergic reactions include anaphylaxis and atopic reactions.
  + Allergic rhinitis, atopic dermatitis, urticaria, and angioedema are common type I hypersensitivity reactions.
* After an allergic disorder is diagnosed, the therapeutic treatment is aimed at reducing exposure to the offending allergen, treating the symptoms, and if necessary, desensitizing the person through immunotherapy.
* **Anaphylactic reactions** occur suddenly in hypersensitive patients after exposure to the offending allergen. They may occur following parenteral injection of drugs (especially antibiotics), blood products, and insect stings.
* Most allergic reactions are chronic and are characterized by remissions and exacerbations of symptoms.
* The major categories of drugs used for symptomatic relief of chronic allergic disorders include antihistamines, sympathomimetic/decongestant drugs, corticosteroids, antipruritic drugs, and mast cell–stabilizing drugs.
* Immunotherapy is the recommended treatment for control of allergic symptoms when the allergen cannot be avoided and drug therapy is not effective.
* Two types of latex allergies can occur: type IV allergic contact dermatitis and type I allergic reactions.
* **Multiple chemical sensitivities**(MCS) is an acquired disorder in which certain people exposed to various foods and chemicals in the environment have many symptoms related to multiple body systems.
* The **human leukocyte antigen** (HLA) system consists of a series of linked genes that occur together on the sixth chromosome in humans. Because of its importance in the study of tissue matching, the chromosomal region incorporating the HLA genes is termed the major histocompatibility complex.
* **Autoimmunity** is an immune response against self. The immune system no longer differentiates self from nonself.
* Immunodeficiency disorders involve an impairment of one or more immune mechanisms, which include the following:

1. Phagocytosis
2. Humoral response
3. Cell-mediated response
4. Complement
5. A combined humoral and cell-mediated deficiency

* Immunodeficiency disorders are *primary* if the immune cells are improperly developed or absent and *secondary* if the deficiency is caused by illnesses or treatment.
* The goal of **immunosuppressive therapy** is to adequately suppress the immune response to prevent rejection of the transplanted organ while maintaining sufficient immunity to prevent overwhelming infection.
* Commonly used immunosuppressive drugs include corticosteroids, cyclosporine, tacrolimus (Prograf), and mycophenolate mofetil (CellCept).

Chapter 15: Infection and Human Immunodeficiency Virus Infection

**INFECTION**

* An **infection** is an invasion of the body by a *pathogen* (any microorganism that causes disease) and the resulting signs and symptoms that develop in response to the invasion.
* The most common causes of infection are bacteria, viruses, fungi, and protozoa.
* An **emerging infection** is an infectious disease whose incidence has increased in the past 20 years or threatens to increase in the immediate future.
* Emerging infectious diseases can originate from unknown sources, contact with animals, changes in known diseases, or biologic warfare.
* **Resistance** occurs when pathologic organisms change in ways that decrease the ability of a drug (or a family of drugs) to treat disease.
* Methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE), and penicillin-resistant *Streptococcus pneumoniae* are three of the most troublesome antibiotic-resistant bacteria currently causing problems in North America.
* **Nosocomial infections** are infections that are acquired as a result of exposure to a microorganism in a hospital setting and typically occur within 72 hours of hospitalization.
* For older adult patients, the rate of nosocomial infection is two to three times higher than for younger patients.

**HUMAN IMMUNODEFICIENCY VIRUS INFECTION**

* The **human immunodeficiency virus** (HIV) isa ribonucleic acid (RNA) virus, which means it replicates going from RNA to deoxyribonucleic acid (DNA).
* HIV can only be transmitted under specific conditions that allow contact with infected body fluids, including blood, semen, vaginal secretions, and breast milk.
* Sexual contact with an HIV-infected partner is the most common mode of transmission.
* Immune dysfunction in HIV disease is caused predominantly by damage to and destruction of CD4+ T cells (also known as T helper cells or CD4+ T lymphocytes).
* The major concern related to immune suppression is the development of **opportunistic diseases** (infections and cancers that occur in immunosuppressed patients that can lead to disability, disease, and death).
* HIV infections are divided into acute, early chronic, intermediate chronic, and late chronic infection.
* Late chronic infection is also known as **acquired immunodeficiency syndrome** (AIDS).
* The most useful screening tests for HIV are those that detect HIV-specific antibodies. The major problem with these tests is that there is a median delay of 2 months after infection before antibodies can be detected. This creates a **window period** during which an infected individual may not test positive for HIV-antibody.
* The goals of drug therapy in HIV infection are to (1) decrease the **viral load,** (2) maintain or raise CD4+ T cell counts*,* and (3) delay the development of HIV-related symptoms and opportunistic diseases.
* The major drug classifications for HIV include nonnucleoside reverse transcriptase inhibitors (NNRTIs), nucleoside reverse transcriptase inhibitors (NRTIs), nucleotide reverse transcriptase inhibitors (NtRTIs), protease inhibitors (PIs), and entry inhibitors.
* Management of HIV is complicated by the many opportunistic diseases that can develop as the immune system deteriorates.
* Examples of opportunistic infections include *Pneumocystis jiroveci* pneumonia (PCP), *Mycobacterium avium* complex (MAC),and Kaposi sarcoma.
* Nursing care for individuals not known to be infected with HIV should focus on behaviors that could put the person at risk for HIV infection and other sexually transmitted and blood-borne diseases.
* The overriding goals of therapy for infected individuals are to keep the viral load as low as possible for as long as possible, maintain or restore a functioning immune system, improve the patient’s quality of life, prevent opportunistic disease, reduce HIV-related disability and death, and prevent new infections.
* HIV-infected patients share problems experienced by all individuals with chronic diseases, but these problems are exacerbated by negative social constructs surrounding HIV.